

REMARKS

Claims 1-13 are pending in the application. Claim 1 has been amended. Claims 9-21 were previously canceled. No new matter is introduced with the amendments to the claims.

It is believed that the remarks laid out herein below attend to all rejections and further issues raised in the pending office action dated June 8, 2006.

SPECIFICATION

The specification stands rejected based upon the current title. Examiner proposed a more descriptive title which is acceptable to applicant. Accordingly, please replace the current title with the following:

METHOD OF FABRICATING A COMPOSITIONALLY MODULATED ELECTRODE IN A
MAGNETIC TUNNEL JUNCTION DEVICE

CLAIMS

Claims 1-8 are pending in the application. Claims 2-8 depend from independent claim 1. Claims 22-32 are newly added, with claims 22, 23 and 24 depending from claim 1, claims 26-32 depend from independent claim 25. No new matter has been added with the amendments to claims 1, and 22-32.

Claim Rejections – 35 U.S.C. §102(e)

Claims 1-3, and 6-8 are rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No: 6,993,827 to Horng et al., hereinafter "Horng". Applicants respectfully disagree.

A brief summary of the Applicant's invention and Horng may be helpful to Examiner in understanding the differences before a more detailed response specific to the claims at issue.

As the revised title of the application suggests, the immediate application teaches a method of fabricating a compositionally modulated electrode **17** for use in connection with a magnetic tunnel junction device **10**. Each compositionally modulated electrode **17** provides a region of high resistivity **18** that is aligned to a magnetic tunnel junction device **10**, or more specifically as shown FIG. 6, a plurality of high resistivity regions **18**, each region **18** aligned to a magnetic tunnel junction device **10**.

As is described and shown with respect to FIGs. 7, and 9a-9e, the electrode **17** consists essentially of a single metal or alloy that is deposited or otherwise formed upon the stack **20** (which corresponds to the layers of the magnetic tunnel junction device **10**). The electrode **17** has a first resistivity substantially throughout. A mask layer is deposited upon the electrode and patterned so as to expose portions **17e** of the electrode **17**, see FIG. 9c. These exposed portions **17e** present areas which are treated by a plasma process to produce the high resistivity regions **18** within electrode **17**. Lastly, the mask is removed.

Moreover, the process provides a homogenous metal conductor **17** with localized high resistivity regions **18** imparted by the plasma process upon the exposed areas **17e**. The high resistivity regions **18** are aligned to the magnetic tunnel junction devices **10** with regions of first resistivity on either side.

On the other hand, Horng discloses a method of making a bottom spin valve. FIG. 2b as identified by the Examiner discloses an embodiment wherein a patterned lead layer **90** is formed over the sensor stack of FIG. 2a. Lead layer **90** provides openings **95** which expose the cap layer **70**. The sequential patterning process by which opening **95** is provided defines a physical track width for the sensor (not shown). As the process of depositing the lead layer **90** necessitates prior removal of the oxide layer already present on the cap layer **70**, the exposed portions of the cap layer are treated with RIE to restore the oxide to the track width regions and produce a specularly reflecting cap surface (TaO). Col. 6, line 67 thorough Col 7, line 5.

The lead layer **90** *is not subsequently removed, and the resulting electrode structure is not a homogeneous metal conductor*. Further, Horng teaches RIE etching so as to restore oxidation to provide a specularly reflecting cap surface. Horng is silent as to the extent any oxidation imparts any degree of resistivity and certainly that any resistivity change is to a predetermined value.

Now turning to the rejection of claims 1-3, and 6-8, we respectfully remind the Examiner that in order to anticipate a claim, Horng must teach each and every element of the claim, and ***"the identical invention must be shown in as complete detail as contained in the ... claim."*** MPEP 2131 citing *Verdegaal Bros. V. Union Oil Co. of California*, 814 F.2d 628, 2 USPQ2d 1051 (Fed. Cir. 1987) and *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 9 USPQ2d 1913 (Fed. Cir. 1989) (emphasis added).

Applicant respectfully submits that many differences exist in the claimed elements between Horng and Applicant's claimed invention such that Horng cannot be said to anticipate Applicant's invention. More specifically, Horng does not teach every element of claims 1-3 and 6-8 as demonstrated herein below.

Independent claim 1 has been amended to specifically note the homogeneous nature of electrode **17** as shown and described in the specification. More specifically, amended claim 1 now reads:

A method of fabricating a compositionally modulated electrode in a magnetic tunnel junction device, comprising:
depositing a mask layer on a surface of a previously fabricated
homogeneous electrode of the magnetic tunnel junction device, the electrode device including a first resistivity **and overhanging the magnetic tunnel junction**;
patterning a plasma mask in the mask layer;
forming the plasma mask in the mask layer so that a portion of the surface is exposed by the plasma mask;
forming a high resistivity region that extends inward of the surface by exposing the portion of the surface to a plasma process selected from the group consisting of a plasma oxidation process, a plasma nitridation process, and a plasma carburization process, the high resistivity region including a second resistivity that is higher than the first resistivity; and
removing the plasma mask from the surface of the electrode **to expose a homogeneous electrode having a region of high resistivity adjacent to at least one region of first resistivity.**

As noted above Horng teaches a method of making a bottom spin valve. Horng does not teach a homogeneous electrode. Moreover, with respect to FIG. 2b, Horng clearly teaches a spin valve cell having a lead layer **90** disposed upon a capping layer **70** with a gap **95** between portions of the lead layer **90**. Assuming for the moment that Examiner may argue the capping layer **70** as an electrode, the capping layer **70** of the spin valve cell is not taught or disclosed to overhang the cell.

With respect to Applicant's described method and FIGs. 6, 6b and 9a-9e, the electrode **17** is clearly shown and understood to be a homogeneous electrode and to overhang the magnetic tunnel junction.

In addition, Horng does not teach depositing a plasma mask layer on the surface of the electrode and that the plasma mask is removed from the surface of the electrode. Rather, Horng teaches that a lead layer **90** may be formed upon the sensor stack, and that the opening **95** in the lead layer **90** permits RIE etch of the capping layer. Horng does not teach the lead layer **90** as a mask layer that is removed, or that once the lead layer **90** is removed there is an exposed region of high resistivity adjacent to at least one exposed region of first resistivity.

Claim 1 is therefore clearly not anticipated by Horng.

With respect to Claims 2 and 3, Examiner appears to over state the teachings of Horng. Horng makes no express statement regarding resistivity or that a region of resistivity extends inward from the surface. As Horng fails to expressly discuss resistivity as the direct

result of oxidation, any such assessment is at best inference. Regardless, as claim 2 depends from claim 1, claim 2 includes the points of distinction as identified above, and is therefore clearly not anticipated by Horng. Claim 3 is likewise not anticipated by Horng as the inclusion of plasma oxidation does not undue the points of distinction already established for claim 1.

With respect to claims 6 and 7, any such photoresist as may be suggested by Horng is apparently disposed upon the lead layer **90** and not the capping layer **70**. It is unclear whether Examiner construes lead layer **90** to be the electrode, the capping layer **70** to be the electrode, or a combination of lead layer **90** and capping layer **70** to be the electrode. Regardless, these structures, individually or in combination do not equate to the homogeneous conductor **17** as set forth by Applicant. If the lead layer **90** is set forth as the conductor, the oxidized area **71** is clearly not disposed within the lead layer **90**. If capping layer is set forth as the conductor, the lead layer is not the photoresist plasma mask which Applicant teaches is disposed upon the surface of the conductor.

In addition to these arguments, claims 6 and 7 incorporate the points of distinction as set forth above with respect to claim 1 and are therefore most certainly not anticipated by Horng.

New claims 22, 23 and 24 further set forth the distinct properties of the electrode as described and illustrated by Applicant and are most certainly not anticipated by Horng.

For the reasons argued above, among other reasons not specifically laid out herein, Applicant contends that Horng fails to anticipate the above Claims. Withdrawal of the Examiner's rejection and allowance of each of Claims 1, 2, 3, 6, 7 and 8 is respectfully requested.

Claim Rejections – 35 U.S.C. § 103(a)

The subject matter of the present application was commonly owned at all times, thus the concern regarding separate invention dates attributable to different parties is moot.

For the purpose of the following discussion, the Examiner is respectfully reminded of the basic considerations which apply to obviousness rejections.

When applying 35 U.S.C. §103, the following tenets of patent law must be adhered to:

- (A) The Claimed invention must be considered as a whole;
- (B) The references must be considered as a whole and must suggest the desirability and thus the obviousness of making the combination;
- (C) The references must be viewed without the benefit of impermissible hindsight vision afforded by the Claimed invention; and
- (D) Reasonable expectation of success is the standard with which obviousness is determined. MPEP §2141.01, *Hodosh v. Block Drug Co., Inc.*, 786 F.2d 1136, 1134 n.5, 229 U.S.P.Q. 182, 187 n.5 (Fed. Cir. 1986).

In addition, it is respectfully noted that to substantiate a *prima facie* case of obviousness the initial burden rests with the Examiner who must fulfill three requirements. More specifically:

To establish a *prima facie* case of obviousness, three basic criteria must be met.

First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the references or to combine reference teachings.

Second, there must be a reasonable expectation of success.

Finally, the prior art reference (or references when combined) must teach or suggest all the Claim limitations. The ***teaching or suggestion*** to make the Claimed combination **and the *reasonable expectation of success must both be found in the prior art, and not based on Applicant's disclosure.*** (emphasis and formatting added) MPEP § 2143, *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991)

The Examiner has rejected claims 4 and 5 as being allegedly unpatentable over Horng in view of U.S. Patent No. 6,887,717 ("Hiramoto"). Applicant respectfully disagrees and traverses the rejection. Applicant includes herein by reference each and every statement made above, in addition these claims are also patentable for the following additional reasons.

Paralleling the MPEP references cited above, the Federal Circuit has enunciated several guidelines in making a §103 obviousness determination. A *prima facie* case of obviousness is established when and only ***when the teachings from the prior art itself*** would appear to have ***suggested*** the Claimed subject matter to a person of ordinary skill in the art. *In re Bell*, 991 F.2d 781, 783, 26 U.S.P.Q.2d 1529, 1531 (Fed Cir. 1993) (quoting *In re Rinehart*, 531 F.2d 1048, 1051 (C.C.P.A. 1976)). (Emphasis added). "The mere fact that the prior art ***may*** be modified in the manner suggested by the Examiner does ***not*** make the modification obvious unless the prior art suggested the desirability of the modification." (emphasis added) *In re Fritch*, 23 U.S.P.Q.2d 1780, 1783-84 (Fed. Cir. 1992).

As discussed above Horng teaches a method of making a bottom spin valve device that is quite separate and distinct from the method of method of fabricating a compositionally modulated electrode for use in connection with a magnetic tunnel junction device set forth by Applicant.

Hiramoto although teaching a method of producing a magnetoresistive device provides a device that is quite distinct from the compositionally modulated electrode as set forth by Applicant.

The combination of the references can not and does not result in the method disclosed by Applicant. There is no teaching, suggestion or motivation to be found that would suggest

that the use of a plasma nitridation process or a plasma carburization process as taught by Hiramoto would spontaneously result in the homogeneous conductor set forth by application, or that the conductor would have at least one region of high resistivity aligned to the magnetic tunnel junction and at least one region of first resistivity offset from the magnetic tunnel junction.

This is perhaps an “**obvious to try**” rejection. Such a rejection is improper and has long been criticized and rejected as it is not a sufficiently discriminatory test. *See In re Lindell*, 155 USPQ 521, 523 (C.C.P.A. 1967.) Applicant submits that the use of the plasma nitride process or plasma carburization process in Hiramoto as perceived by Examiner would in no way result in the conductor set forth by Applicant.

Absent the teaching, suggestion or motivation to combine the references and produce the method disclosed by Applicant, these references cannot and should not be taken to render Applicants disclosed method as obvious. For at least these reasons Examiner’s rejection of claims 4 and 5 should be withdrawn.

As the specification and figures present the conductor a compositionally modulated electrode **17** for use in connection with a plurality of magnetic tunnel junction devices **10**, see FIG. 6 and the method illustrated in FIGs. 9a – 9e, Applicant presents new claims 25 through 31 which more specifically identify the applicability of the compositionally modulated electrode to multiple magnetic tunnel junction devices.

In light of the above discussion and points of distinction of the original claims over Horng and Hiramoto, Examiner will appreciate the further distinctions of such a conductor spanning multiple magnetic tunnel junction devices. Indeed the distinctions for a specific magnetic tunnel junction device are more pronounced and easily perceived in the context of a plurality of devices. As the underlying structure and method have simply been expanded from the case of a cell to multiple cells, the distinctions over Horng and Hiramoto remain and as no new elements have been introduced, no further search is required.

As such Applicant submits the above arguments presented with respect to claims 1-8 are applicable to new claims 25-31 and claims 25-31 are therefore properly distinct and ready for issue.

CONCLUSION

For the reasons given above, and after careful review of all the cited references, Applicant respectfully submits that none of the cited references, nor any combination of the cited references, will result in, teach or suggest Applicant’s Claimed invention. But even if any such combination might arguably result in such Claimed invention, it is submitted that such combination would be non-obvious and patentable.



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In view of the above Amendments and Remarks, Applicant has addressed all issues raised in the Office Action dated June 8, 2006, and respectfully solicits a Notice of Allowance for Claims 1-8 and 22-32. Should any issues remain, the Examiner is encouraged to telephone the undersigned attorney.

It is believed that all of the pending Claims have been addressed. However, the absence of a reply to a specific rejection, issue or comment does not signify agreement with or concession of that rejection, issue or comment. In addition, because the arguments made above may not be exhaustive, there may be reasons for patentability of any or all pending Claims (or other Claims) that have not been expressed. Finally nothing in this paper should be construed as an intent to concede any issue with regard to any Claim, except as specifically stated in this paper, and the amendment of any Claim does not necessarily signify concession of unpatentability of the Claim prior to its amendment.

Applicant believes that no fees are currently due; however, should any fee be deemed necessary in connection with this Amendment and Response, the Commissioner is authorized to charge deposit account 08-2025, referencing the Attorney docket number 200209240-1.

Respectfully submitted,

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